EXPLORING EARTH'S MYSTERIES
...PROTECTING ITS FUTURE

# Brookhaven National Laboratory
# Major Petroleum Facility
# and Central Steam Facility

## Facility Environmental Monitoring Report

## Calendar Year 2000

BROOKHAVEN
NATIONAL LABORATORY

April 17, 2001

Prepared by:
D. Paquette, J. Williams and R. Lee
Environmental Services Division

**GW65ER.01**

**Brookhaven National Laboratory**
**Major Petroleum Facility and Central Steam Facility**
**Facility Environmental Monitoring Report**
**Calendar Year 2000**

***Summary of Results****: Analysis of environmental samples collected at the Major Petroleum Facility during 2000 indicates that current operations are not impacting air or groundwater quality. As in previous years, the volatile organic compound 1,1,1-trichloroethane was detected in upgradient monitoring well 076-25. This contamination originates from historical releases at Building 650, and is not related to Major Petroleum Facility or Central Steam Facility operations. Continuous emission monitoring data and No. 6 fuel oil analytical sample results collected during 2000 confirm that the four boilers at the Central Steam Facility are fully compliant with applicable emission standards and with NYSDEC operating permits.*

# Background

The Major Petroleum Facility (MPF) is the holding area for fuels used at the Central Steam Facility (CSF). Fuel oil for the CSF is held in a network of seven above ground storage tanks, two of which are currently inactive. The tanks, which have a combined capacity to contain up to 2.3 million gallons of #6 fuel oil and 60,000 gallons of #2 fuel oil, are connected to the CSF by above ground pipelines that have secondary containment and leak detection devises. All fuel storage tanks are located in bermed containment areas that have a capacity to hold >110% of the volume of the largest tank located within each bermed area. The bermed areas have bentonite clay liners consisting of either Environmat (consisting of bentonite clay sandwiched between geotextile material) or bentonite clay mixed into the native soils to form an impervious soil/clay layer. As of December 1996, all fuel unloading operations were consolidated in one centralized building that has secondary containment features. The MPF is operated under a New York State Department of Environmental Conservation (NYSDEC) permit (Permit #1-1700), and as required by law, a Spill Prevention Control and Countermeasures Plan and a Facility Response Plan have been developed for the facility (BNL, 2000a; BNL, 2000b).

The CSF uses four boilers to supply steam for heating and cooling to BNL major facilities through an underground steam distribution and condensate grid. To control emissions of nitrogen oxides (NOx), a pollutant that contributes to the formation of ozone in the lower atmosphere, both the USEPA and the NYSDEC have enacted regulatory requirements that restrict NOx emissions from large and midsize boilers. The CSF uses a combination of engineering and administrative controls to comply with applicable NOx emission standards.

For Boilers Nos. 1A and 5, compliance with the NOx emission standard of 6 NYCRR Part 227-2 is achieved through the use of low excess air burners. Initial compliance with this standard was demonstrated through stack testing conducted in January 1995 while each boiler burned No. 6 oil with fuel nitrogen and sulfur contents of less than 0.3 percent. To help to ensure compliance with the NOx limits, all CSF contracts with No. 6 oil suppliers specify that No. 6 oil delivered to the MPF have a nitrogen content not greater than 0.3 percent by weight.

In addition to the emission limits of 6 NYCRR Part 227-2, Boiler Nos. 6 and 7 must comply with NOx emission limits of New Source Performance Standard, 40 CFR 60 Subpart Db. Boiler No. 7 must also comply with 40 CFR 60 Subpart Db stack opacity monitoring requirements. Both boilers use dual fired low NOx burners to meet the emission standards. To demonstrate initial compliance with the Subpart Db standard, stack tests were conducted on Boilers 6 and 7 in October 1991 and May 1996 respectively. In accordance with Subpart Db requirements, NOx continuous emission monitors are used on both boilers and a continuous opacity monitoring system is used on Boiler 7 to ensure continuous compliance with the NOx and opacity standards.

# Environmental Monitoring Program

BNL has established air and groundwater monitoring programs at the CSF and MPF to evaluate potential impacts to environmental quality and to demonstrate compliance with DOE requirements and applicable federal, state and local laws, regulations and permits. The environmental monitoring program for the MPF is described in the BNL Environmental Monitoring Plan (Daum *et al*. 2000; BNL, 2001).

# Monitoring Results

### Air

The primary objective of air monitoring efforts at the CSF is to verify compliance with applicable federal and state NOx emission and opacity standards. This is accomplished either through periodic monitoring of residual fuel deliveries to the MPF or continuous monitoring of NOx and opacity emissions through monitoring ports in stacks for Boilers 6 and 7. Monitoring results were provided to the NYSDEC on a quarterly basis (Zimmerman, 2000a; Zimmerman, 2000b; Zimmerman, 2000c; Cunniff, 2001)

Since there are no continuous emissions monitoring requirements for Boilers 1A and 5, the CSF uses the measured nitrogen content from composite samples of No. 6 fuel deliveries to the MPF during the quarter as a surrogate indicator for compliance with NOx emission standards. Because there were no residual oil deliveries during the first two quarters of the year, NOx analytical results from September 1999 fuel samples are representative of the oil consumed during the quarters. Analysis of composite samples of

residual fuel oil deliveries to MPF storage tanks during the third and fourth quarters of CY 2000 confirmed that the fuel bound nitrogen content of No. 6 oil burned was less than 0.3 percent by weight.

From May 1 to September 15 (the peak ozone period), compliance of Boilers 6 and 7 with the NOx emissions limits was demonstrated by calculating the 24-hour average emission rate from continuous emission monitor readings, and comparing this value to the emission standards (0.30 lbs/MMBtu for oil and 0.20 lbs/MMBtu for gas). For the remainder of the year, the calculated 30-day rolling average emissions rate was used to establish compliance. In CY 2000, there were no measured exceedances of the NOx emission standard for either boiler. For the year, NOx emissions from Boiler 6 averaged 0.264 lbs/MMBtu when No. 6 oil was burned and 0.112 lbs/MMBtu for natural gas. Similarly, the annual average NOx emissions recorded by the continuous emission monitors on Boiler 7 when No. 6 oil and natural gas were burned were 0.255 lbs/MMBtu and 0.099 lbs/MMBtu respectively.

Boiler 7 flue gas opacity is measured by a transmissometer mounted on the stack above the CSF roofline. Opacity readings are taken at 15-second intervals and reported as 6-minute averages. During the year, there were no measured exceedances of the opacity standard.

**Groundwater**

The MPF's groundwater monitoring program is designed to confirm that the engineered and institutional controls in place are effective in preventing contamination of the aquifer. In April 2000, five wells (076-16, 076-17, 076-18, 076-19 and 076-25) were used to monitor for potential contaminant releases (Figure 1). By October 2000, BNL incorporated three new wells (076-378, 076-379 and 076-380) into the MPF monitoring program.

Presently, the MPF stores primarily No. 2 and No. 6 fuel oil. Groundwater contaminants from these products can travel both as free product and in dissolved form with advective groundwater flow. The need to monitor for both forms of transport is reflected in the MPF groundwater monitoring plan. In accordance with the Special License Conditions, groundwater samples are analyzed semiannually for the Polynuclear Aromatic and Base Neutral Compounds contained in USEPA test method 625. During CY 2000, none of the target compounds were detected (Zimmerman, 2000; Cunniff, 2000). The MPF wells were tested monthly for the presence of floating petroleum hydrocarbons. As in previous years, no floating product was observed.

In addition to the required testing for semi-volatile organic compounds described above, BNL also analyzed samples collected in October for the presence of volatile organic compounds (VOCs). The solvent 1,1,1-trichloroethane (TCA) was detected in upgradient Well 076-25 at concentrations of 25 µg/L (Table 1). Low levels (up to 2 µg/L) of tetrachloroethylene and 1,1-dichloroethylene were also detected in several wells. The

NYS AWQS for these compounds is 5 µg/L. The detection of TCA in upgradient Well 076-25 is consistent with historical monitoring results, and it is believed that the TCA originates from contaminated soils associated with historical operations at Building 650.

## Future Monitoring Actions

The following actions are recommended for the CY 2001 monitoring period:

- Fully incorporate new monitoring wells 076-378, 076-379 and 076-380 into the MPF monitoring program.
- Maintain the groundwater monitoring program on its current semiannual schedule as required by the NYSDEC license.
- Maintain the air monitoring program on its current schedule as required by the NYSDEC license.

## References


BNL, 2000a. *Brookhaven National Laboratory, Oil and Chemical Spill Prevention and Countermeasures Plan* (December 15, 2000).

BNL, 2000b. *Brookhaven National Laboratory, Facility Response Plan* (December 15, 2000).

BNL, 2001. *Brookhaven National Laboratory Environmental Monitoring Plan, CY 2001 Update* (January 2001). BNL-52584 Update.

Cunniff, L.E., 2000. Letter from L.E. Cunniff to F. Crescenzo. *Brookhaven National Laboratory MPF License (No. 01-1700) Special Condition 2(b) – MPF Semi-Annual Monitoring Well Testing Requirements* (December 20, 2000).

Cunniff, L.E., 2001. Letter from L. E. Cunniff to M. Holland. *Brookhaven National Laboratory Quarterly Site-Wide Air Emissions / Monitoring Systems Performance Report (*January 16, 2001).

Daum, M., Dorsch, W., Fry, J., Green, T., Lee, R., Naidu, J., Paquette, D., Scarpitta, S., and Schroeder, G., 2000. *Brookhaven National Laboratory, Environmental Monitoring Plan 2000* (March 31, 2000).

Zimmerman, E.A., 2000a. Letter from E.A. Zimmerman to F. Crescenzo. *Brookhaven National Laboratory MPF License (No. 01-1700) Special Condition 2(b) – MPF Semi-Annual Monitoring Well Testing Requirements* (June 15, 2000).

Zimmerman, E.A., 2000b. Letter from E.A. Zimmerman to G. Malosh. *Brookhaven National Laboratory Quarterly Site-Wide Air Emissions / Monitoring Systems Performance Report (*April 21, 2000).

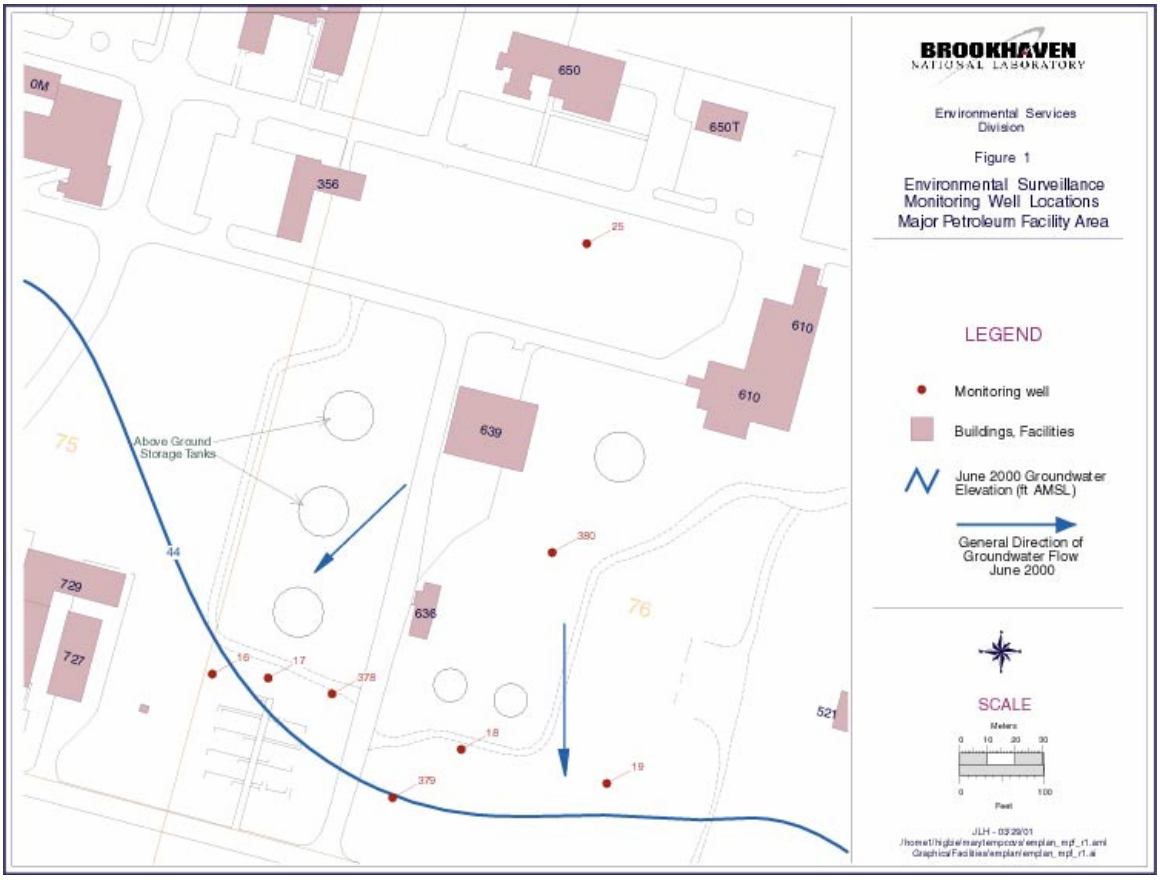
Zimmerman, E.A., 2000c. Letter from E.A. Zimmerman to F. Crescenzo. *Brookhaven National Laboratory Quarterly Site-Wide Air Emissions / Monitoring Systems Performance Report (*July 17, 2000).

Zimmerman, E.A., 2000. Letter from E.A. Zimmerman to F. Crescenzo. *Brookhaven National Laboratory Quarterly Site-Wide Air Emissions / Monitoring Systems Performance Report (*October 20, 2000).

**BNL Facility Environmental Monitoring Report**
**Major Petroleum Facility**
**Groundwater Monitoring Program**
**Volatile Organic Compound Analytical Results for CY 2000**
**Table 1**

| Well | Sample Period | 1,1,1-TCA (ug/L) | Tetrachloroethylene (ug/L) | 1,1-DCE (ug/L) |
|---|---|---|---|---|
| 076-25 (a) | October | 25.0 | 2.0 | <1.0 |
| 076-16 | October | <1.0 | <1.0 | <1.0 |
| 076-17 | October | <1.0 | <1.0 | <1.0 |
| 076-18 | October | <1.0 | <1.0 | <1.0 |
| 076-19 | October | <1.0 | <1.0 | <1.0 |
| 076-378 | October | <1.0 | <1.0 | <1.0 |
| 076-379 | October | <1.0 | <1.0 | 2.0 |
| 076-380 | October | <1.0 | <1.0 | <1.0 |
| MDL | | 1 | 1 | 1 |
| NYSAWQS | | 5 | 5 | 5 |

MDL: Minimum Detection Limit
(a): Upgradient well.


BROOKHAVEN
NATIONAL LABORATORY
Environmental Services
Division
Figure 1
Environmental Surveillance
Monitoring Well Locations
Major Petroleum Facility Area
LEGEND
Monitoring well
Buildings, Facilities
June 2000 Groundwater
Elevation (ft AMSL)
General Direction of
Groundwater Flow
June 2000
SCALE
Meters
0 10 20 30
0 100
Feet
JLH - 03/29/01
/home1/higbie/marytempcov/emplan_mpf_r1.aml
Graphics/Facilities/emplan/emplan_mpf_r1.ai
0M
650
650T
356
25
610
610
639
75
Above Ground
Storage Tanks
44
729
727
380
636
76
16
17
378
18
379
19
521